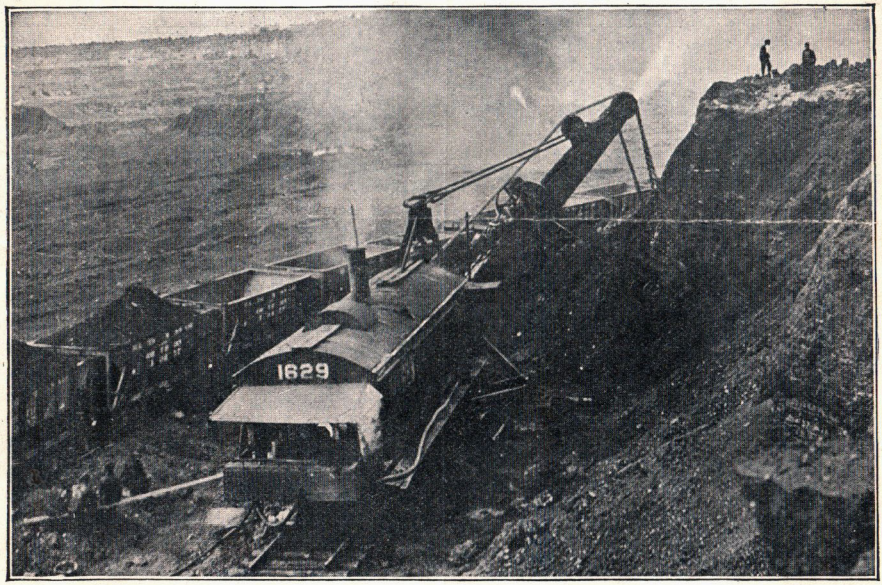
MECCANO MAGAZINE
for Boys

Vol. VII, No. 4 JULY 1925 Price 5 cents

The Story of Iron and Steel



An open-pit mine in operation

ALTHOUGH all Meccano boys are familiar with steel—for they use it every time they build a model—how many of them realize how much the whole world depends upon it? From the pen-point that we write with to the massive bridges across our rivers, steel plays an all-important part in the daily life of everyone. If the supply of steel should suddenly come to an end, not only would the Meccano factories have to close down—terrible thought for a Meccano boy!—but so also would every other factory, and nearly every industry in the world would quickly come to a standstill.

(*Continued on Page 3*)

The Story of Iron and Steel We commence in this issue the "Story of Iron and Steel," and I am looking forward to hearing my readers' comments on this story. This series of articles will tell the complete story of iron and steel from the mine to the finished product. Special illustrations have been obtained, and for these and many other courtesies in the preparation of these articles we are greatly indebted to the American Steel and Wire Co.

The Appeal of the Limerick It was more than gratifying to see the great response of my readers in the Limerick Contest. Entries were received from 32 states—from Maine to California and Minnesota to Texas. Many excellent last lines were submitted, and in several instances boys living thousands of miles apart sent in identical last lines. Great minds do think alike! Another Limerick Contest is announced on page 11.

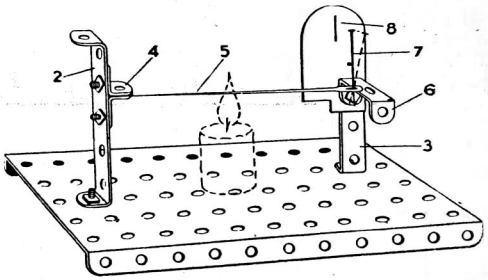
A Loco as Strong as 7,000 Horses Truly we live in a wonderful age. On pages 6 and 7 of this issue there is a picture and description of the latest production of the Westinghouse Co.—a giant locomotive with the strength of 7,000 horses. The wonders of electricity are unending and I am sure my readers will find this article of great interest.

Photographic Contest Our first Photographic contest is announced on page 11, and I believe this will prove to be very popular. No doubt many of my readers are amateur photographers, and in this connection I should like to direct special attention to the article on page 5. The model described there is very easy to build and your editor has been greatly surprised at the many remarkable photographs of birds taken with this apparatus. Unfortunately directions for building the model were crowded out of this issue, but they will appear in the September number.

An Ideal Vacation Several readers have written to tell me of the good times they were having on their vacations—camping, fishing, bathing, etc., and their letters were most welcome. There is real pleasure in reading the enthusiastic accounts of happy boyhood and I hope more of my readers will remember the editor during their vacation. Send me some snapshots and I will try to publish them in the "*M. M.*"

A Model to Show How Metals Expand when Heated

Everybody knows that metals expand with heat and contract with cold, and that is the reason why railway rails are laid with a small space between each so they can "stretch," as it were, without forcing one another out of position. The little model shown below illustrates in a simple and interesting way this expansion and contraction.



Model to demonstrate the expansion of metals

The base of the model consist of a Flanged Plate (1) carrying two upright 2½" × ½" Double Angle Strips (2 and 3). Two Angle Brackets (4) hold a large needle (5)—such as an ordinary darning needle—firmly by its point, and so placed that its eye rests lightly on the Double Brackets (6) as shown. A pin (7) is now fixed with its point in the eye of the needle, not firmly but just so that it will stand upright, with its point resting against the edge of the Double Bracket (6). A small piece of lighted candle is then placed beneath the needle and left until the latter becomes quite hot. If the head of the pin is closely watched it will be seen to move gradually as the needle expands. A piece of cardboard (8) may be cut in the shape illustrated and bolted to the Double Angle Strip (3) so that the movement of the pin can be more clearly followed.

* * *

200 feet up in the Air Riveting Girders

The mere thought makes one shiver, yet there has been much work of this nature, filled with daring episodes, in the construction of the Philadelphia-Camden bridge, the longest suspension bridge in the world. The Editor detailed a special correspondent to cover this for the "*M.M.*" and his story, with a number of thrilling photographs, will appear

in the September Issue

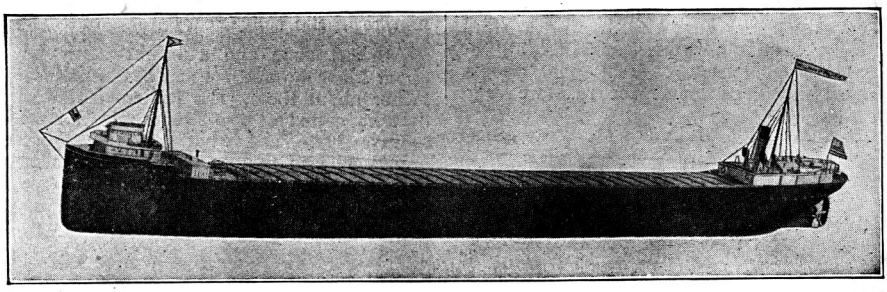
The Story of Iron and Steel

(*Continued from Page 1*)

Steel is made from iron, and so iron is all-important to home life and industry. Iron ore is found in very many parts of the world; in some places the ore lies close to the surface of the earth; in others it is deep down, and the method of getting it varies accordingly. You have probably seen some old piece of iron lying in a field or junk yard, and noticed the thick red rust on it. If you took the rust and ground it up until it was like dust and then mixed it with earth it would resemble some of the soft iron ores.

kind of ore-mining. The excavation is over 300 feet deep, nearly a mile wide and 2½ miles long; over 7½ million tons of ore are taken out of it each year.

The Missabe range is probably the greatest iron ore deposit in the world, and has supplied countless thousands of tons of ore for a number of years. The range extends over 100 miles, and the ore lies quite near the surface, as shown in the sectional drawing on page 8.



An Ore Vessel of the Great Lakes

Open-pit Mining

When the iron ore is very near the surface of the earth it is mined by what is known as the "open-pit" method. Steam shovels dig into the earth and uncover the ore; this is known as "stripping" and after the stripping is done the steam shovels proceed to dig out the ore.

Railroad tracks are laid on top of the ore and long trains of cars are run onto them. The steam shovels fill the cars with the valuable ore, the engine puffs and strains to draw the heavy load up to the surface, and the ore is on its way to the blast furnace.

Some idea of the extent of an open mine may be obtained from the picture on page 1. Here we see a steam shovel loading the cars. What an insatiable appetite this monster has! With apparently irresistable power it tears away the side of the cliff, taking over five tons at a bite, two bites a minute, or 600 tons an hour! Afar off in the background can be seen the opposite crest of the excavation, and the vast open ridges of ore are plainly visible. Before this great bed of ore could be reached it was necessary to remove a thick forest on the surface, and then to strip off a layer of earth and rock 25 to 50 feet deep. This open pit mine is in the Missabe range in Minnesota, and it is a most remarkable example of this

Underground Mining

But not all iron ore can be mined by the open-pit method. Many ore deposits are located far below the surface—so far, in fact, that it would be too costly to resort to stripping to expose the ore and this is removed by underground mining. Shafts are sunk into the ground down to the level of the ore, and at the bottom of the shaft a large underground room is excavated. From this chamber tunnels are dug to various parts of the ore bed. Of course the shafts, chambers and tunnels are carefully lined and propped with timber ("pit props") to keep them from caving in. In some cases where the ore is very deep, underground chambers with their radiating tunnels are excavated at various levels along the shaft, which may be half a mile or more deep.

In each tunnel a narrow-gauge railroad track is laid and dump-cars carry the ore to the shaft, where it is loaded into an elevator and hoisted to the surface.

How long the ore has laid in the range no one knows—it may be thousands, even millions of years. During all this time the weight of the earth above has been compressing it until the ore has become as hard as rock. No steam shovel would be of use here, even if there was room to operate one, and the only way to loosen the ore is to blast it with dynamite.

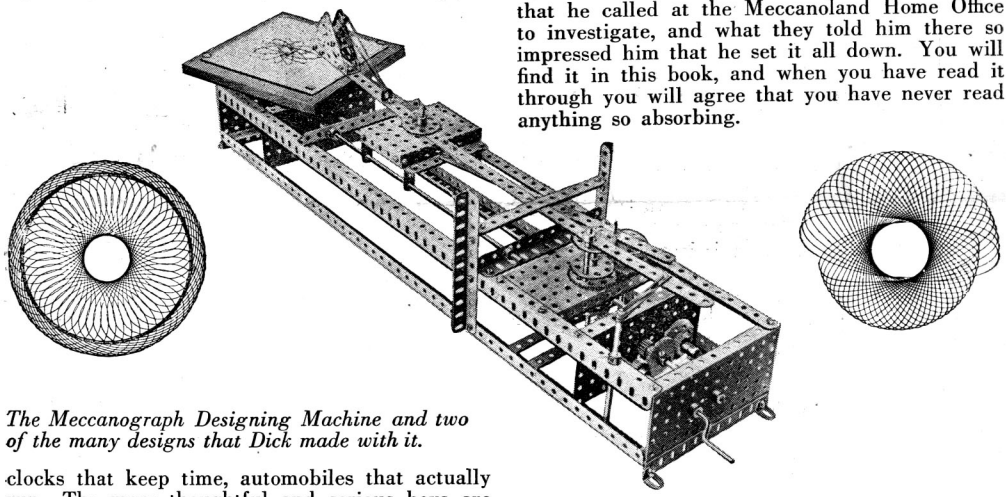
(*Continued on Page 8*)

The Story of Dick's Visit to Meccanoland

A Wonderful New Country

Most people by now have heard of the wonderful new country where nearly all the inhabitants are boys—millions of them; the happy land where all is sunshine and joy; where no strife or dissension comes to mar the happy hours; where harmony and good-fellowship reign supreme. All the inhabitants of this sunny realm are happy and joyous, crowding the fleeting hours with enjoyment and fun.

The young ones are enjoying themselves among miniature cranes and bridges, wagons and windmills, trucks and towers—exquisite little engineering models, which they have built and set to work mechanically. The older ones are building or playing with great structures, real giant cranes, big bridges, ingenious looms for real weaving, clocks that keep time, automobiles that actually run. The more thoughtful and serious boys are busily engaged in inventing and creating new and ingenious models and movements.



The Meccanograph Designing Machine and two of the many designs that Dick made with it.

This happy country is called Meccanoland, and boys from every part of the world live there. Meccano language is the universal boy-language, and all the inhabitants understand and speak it. They have their own newspapers, which deal with topics Meccano boys love to read about; they have their own Clubs and Societies; and they spend happy hours in friendly rivalry, each striving to build better and invent more than all the others.

The Land of Happy Boys

Many boys have lived in Meccanoland for more than ten years, and the longer they live there the happier they are. Every day more boys are crowding into the country eager to learn more of its wonders. The moment they arrive they feel at home, and they take their places and set to work with a will. They know that in Meccanoland they will have the time of their lives; that they will have more fun than they have ever had before—healthy boys' fun. Fun that will make them glad to be alive; fun that will strengthen their characters, set their brains working, and teach them something that will make them into big and successful men.

The sun never sets on Meccanoland, and there is always life and joy there; the gates are never closed, and the only passport you require to enter this wonderful land is a Meccano Outfit. Get your passports to-day, boys, and don't stay another minute in the cold dreary world outside.

A short time ago a bright eager boy heard about Meccano and Meccanoland, and he told his father about them. His father was so interested that he called at the Meccanoland Home Office to investigate, and what they told him there so impressed him that he set it all down. You will find it in this book, and when you have read it through you will agree that you have never read anything so absorbing.

The Spell of a Wonderful Toy

"Say, Dad, it's great!" cried Dick, as he came running into my room with a bundle under his arm.

"What is great?" I asked, looking up from my paper.

"Why, Alan's Meccanograph. He's got . . . . ."

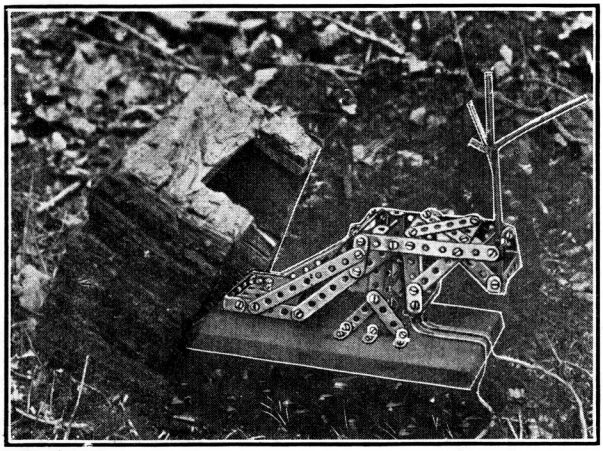
"Alan's what did you say? What is a Meccanograph?"

"Well, I'm trying to tell you. Last Christmas Alan got a Meccano Outfit—the engineering toy that you see advertised in all the papers. He built the dandiest lot of models—a big Bridge, a Crane, a Battleship, and I don't know how many more. Then he wanted some more parts to make new models. His father wouldn't hear of it at first;

(*Continued on Page 8*)

Birds take their own Photographs
—with the aid of Meccano

Have you ever tried to get a "close-up" photograph of a bird? If so, you know what a great amount of patience is required to do it successfully. You hide in the bushes and wait patiently until a bird alights nearby, then slowly manoeuvre to get your camera in a good position. You try not to make any noise, but somehow or other almost invariably you startle the bird, and he flies off.



The Meccano model that makes birds photograph themselves

The weight of the bird on the twig depresses the end of the model and this makes an electrical contact, operating the shutter of the camera.

How Meccano helps

Now Meccano comes to your assistance and relieves you of the uncertainty and long periods of waiting. A Meccano model has been designed by means of which the bird actually takes his own photograph—you don't even have to press the button. And not only does the bird take his own picture, but in addition he rings a bell in your house to tell you to come and change the film! Most obliging, is it not?

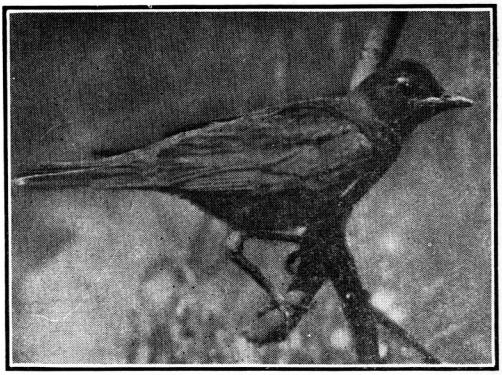
Operation of the Model

The model is illustrated above. It consists of a balance on which is fixed a twig or branch, and it should be placed near a bird-house or other place where birds are known to congregate. The bird alights on the twig and causes the model to close an electrical connection. This operates the shutter of the camera, which has been placed in position in advance and focused on the twig. At the same time that the shutter operates, an electric bell connected in the circuit is made to ring in the house. The model is concealed under a box having a covering of bark, only the twig projecting. In our illustration this cover is tilted back to show the model.

Excellent photographs can be obtained with this model, and if the camera has been carefully focused on the twig and properly "stopped" for the light, the birds will be shown very clearly and in most natural attitudes. The camera need not be concealed for the birds take no notice of it at all, and it can be placed within a few feet of the twig. The picture of the robin shown on this page will give an idea of the kind of picture that results, and it is only one of many that the writer has taken by means of this model.

Releasing the Shutter

The shutter on the camera is actuated by means of electro-magnets, and the actual construction of the device to release the shutter varies with the several kinds of shutter-release on different makes and types of cameras. The shutter on the Graflex camera, with which this model was used, is released by a push-button. It required only a framework to support the camera and magnets, and a simple bell-crank arrangement to press the button. When the electrical contact was closed by the weight of a bird alighting on the twig, the magnets exerted a pull on one arm of the bell-crank. The opposite arm had been so placed that when this occurred it pushed the button—and the picture was taken.



This model is quite easy to build and we shall publish full instructions for assembling it in the next issue of the "*M. M.*"

(To be continued)

The Largest and Most Powe

A New Electric Giant that

The Strength of over 7,000 Horses

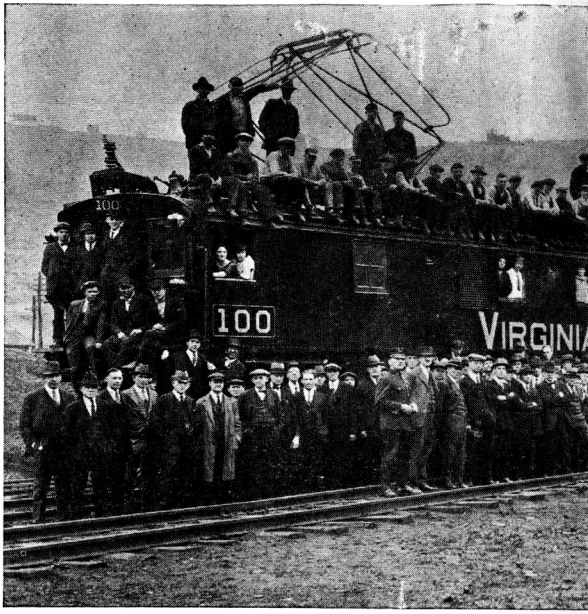
Imagine a team of horses, two abreast, stretching for over five miles! Such an unheard-of team would it take to equal the power of the latest railroad marvel—the largest and most powerful locomotive in the world. This locomotive, an electric giant 151 feet long and weighing over 637 tons, recently underwent its first running test. Its acceleration and the power of the motors were tested and the results were even better than the designers had anticipated. By locking some of the wheels and throwing power on others it was demonstrated that the wheels could be slipped without injury to the motors. This proved that even if some of the motors should become disabled, the locomotive would still be able to proceed under its own power.

How the Electric Locomotive Re-generates Power

Another test was that of regeneration. This is the remarkable ability of the electric locomotive to regenerate power while taking heavy trains down steep grades and to turn the power back into the transmission line. The theory of regeneration is quite simple and Meccano boys should readily be able to understand it. It is well known that certain types of electric motors can also be used as dynamos. As most boys know, a dynamo generates electric current, and it is only necessary to drive the armature shaft of the motor by means of an engine or some other form of power, and the motor functions as a dynamo and delivers current from its terminals.

An Example of Re-generation

Let us imagine that our locomotive has just pulled a heavy train of cars up a steep grade, and has reached the top. As soon as the train has started on its downward trip, it is no longer necessary for the locomotive to pull the train, as the heavy cars are forced by their own weight and by gravity to coast down the hill. The motors in the locomotive are geared to the driving wheels, and as the locomotive coasts down the hill these are caused to turn. The armature shafts of the motors, being connected to the driving wheels, must also turn, and in doing so they generate electricity. This action is known as regeneration, and the current developed is delivered to the power line. Some electric locomotives operating in mountainous territory return to the line by regeneration on steep down grades about 40% of the current consumed on the upgrades. This results in a considerable saving in electricity and gives electric locomotives a decided advantage over their steam-driven brothers for work in hilly territory.



The most powerful locomotive in the world. Bu

The Electric Brake

The grade is a steep one, and if no brakes are used the train will soon travel so fast that it would be impossible to control it. Here is where regeneration proves its worth, for it not only creates current, but it acts as an electric brake while doing so, and aids the engineer in keeping the train within his control. It takes a considerable amount of power to turn the huge motors on the locomotive and when the train is coasting and the motors are regenerating, they act as a drag on the train and slow it up.

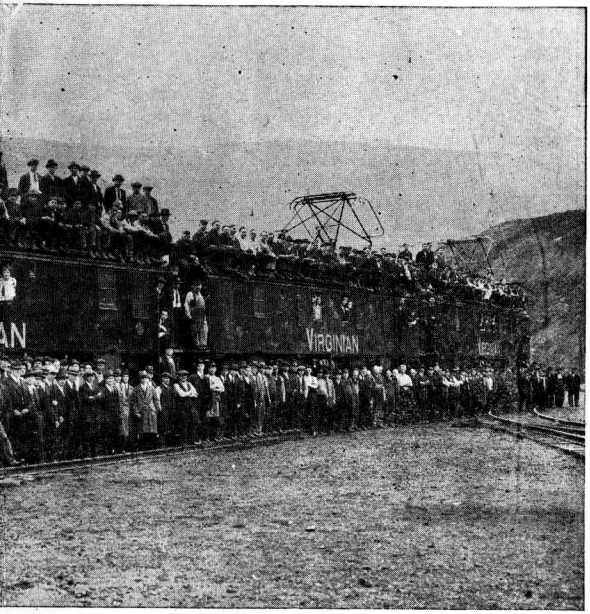
The locomotive illustrated here is the first of 36 ordered by the Virginian Railway for its electrification project between Mullens, W. Va., and Roanoke, Va., and was built by the Westinghouse Electric and Manufacturing Co., and the American Locomotive Co.

These locomotives are so huge that it was necessary

rful Locomotive in the World

weighs 1,275,900 Pounds

to build them in three units each so that the great length of more than 150 feet could successfully negotiate curves and be controlled efficiently. Each unit



uilt by Westinghouse for the Virginian Railroad

weighs approximately 425,000 pounds, so that the weight of the three-cab road engines is 637½ tons. Each driving motor has mounted at each end of the shaft a pinion which meshes with a flexible gear and the gears are mounted on a jack shaft, the power being transmitted from the gear centers to the drive wheels by means of side rods.

A Fifteen Million Dollar Contract

The Virginian R. R. Co.'s electrification contract was the largest ever awarded, amounting to $15,000,000; all electrical apparatus is to be furnished by the Westinghouse Company, to whom we are indebted for our photograph and data. The electrification includes 33.6 miles of route and 213 track miles. To provide for the application of greater power to the transmission system, the Virginian locomotives have been designed for either 11,000 or 22,000 volt current. The power-plant for supplying this current is rapidly nearing completion and it is expected that complete operation of the entire section will be started before the close of the present year. The remainder of the locomotives, after the first is delivered, will be shipped from the Westinghouse works on a schedule of one or two monthly.

The Locomotive of the Future

Slowly but steadily the electric locomotive is supplanting the steam locomotive, and the electrification project of the Virginian Railway is one more important addition to the increasing mileage of track that electricity has wrested from steam.

The ease with which electric trains are handled shows that electricity gives smoother, more reliable and faster running than steam. In addition, great economy results from electrical operation. The most remarkable improvement, however, is in the comfort and pleasure of the passengers. Where previously an otherwise pleasant journey was spoiled by smoke and cinders from the steam locomotive, it is now possible to enjoy the ever-changing scenery from an open car-window or observation platform without inconvenience from this source.

What Edison Predicts

A monster new electric locomotive of 4,200 horse-power was recently on exhibition at Newark, N. J., and was visited by Thomas A. Edison, the famous inventor. He made a close inspection of the locomotive, examining every working part and keeping up a running fire of technical questions. After the examination he was asked for a statement, and waving his hand towards the locomotive he said; "This is an indication of what can and will be done with 'white coal' or electricity. Every railroad must come to it eventually. Every motor vehicle, truck and pleasure car will some day be propelled by electricity. Its powers and uses are still but little known."

Other Electrified Railroads

Three large railroads operate trains electrically from New York—the New Haven R. R., to New Haven, a distance of 75 miles, the New York Central to Harmon, 20 miles and the Pennsylvania to Manhattan Transfer, 10 miles.

The most notable example of electrified railroads is on the Chicago, Milwaukee and St. Paul system. Electric locomotives pull the trans-continental trains from Harlowton, Montana, over the Rocky Mountains to Tacoma, Washington, a total distance of 649 miles. The locomotive inspected by Mr. Edison was built for this line and weighs 283 tons. An illustrated article dealing with this locomotive is in preparation and will be published in a future issue of the "*M.M.*"

Dick's Visit to Meccanoland

(*Continued from Page 4*)

model with the parts he already had, he'd buy him an Inventor's set—that's an Accessory Meccano Outfit, you know."

"Did he do it?" I asked, becoming interested.

"Rather! Why, he made the Meccanograph, and he's lent it to me. Here it is!" Dick placed his bundle on the table, took off all the wrappings and disclosed a neat mechanical contrivance, with a little crank at one end and a wooden platform at the other.

"Lend me your fountain pen, Dad," said Dick. I did so, and he fixed it into the machine so that the point rested on a piece of paper which he had pinned on the little platform.

"Are you ready Dad? Now watch—I'm going to show you something."

The Wonderful Meccanograph

He turned the crank, and the pen immediately began to trace an exceedingly intricate and delicate design. It was the most magical thing I had ever seen.

"How do you work it, Dick?" I asked. "Let me try."

"Wait a minute!" answered Dick. "Wait till I change the design."

"What do you mean?" I exclaimed. "Can you really make the pen draw something else besides the lovely design you have just made?"

"Yes," replied Dick. "All you have to do is to change these little pins to other holes. I don't know how many different designs you can make altogether, but I think it must be thousands and thousands. Last night Alan and I made pictures for two hours; I have them all with me."

He opened a thick bundle of square sheets of paper which he handed over to me. On each was a different kind of Meccanograph design. In some the boys had used colored inks, and had filled in parts of the design with water-colors, giving a most fascinating effect. I gave up all thought of reading my paper, and spent the evening turning the crank and watching the pen go through its magical performance. I forgot all about going to the club, and Dick and I had the jolliest evening —the first of many jolly evenings we were destined to spend with Meccano.

(*To be continued.*)

Our Mail Bag

The Editor regrets that the "Mailbag" column has been crowded out of this issue, but it will appear as usual in September. With so many interesting articles for our readers, it looks as if there will have to be another increase in the size of the "*M. M.*"

The Story of Iron and Steel

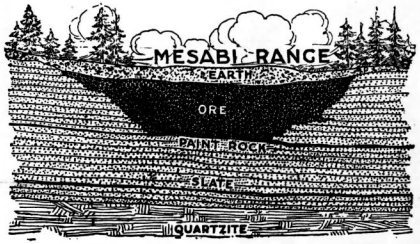
(*Continued from Page 3*)

Now that the ore has been taken from the mine, let us accompany it on its trip to the blast furnace, where it is made into pig-iron, the first stage in the process of turning it into steel.

The long train of cars, loaded with ore, steams to one of the Lake Superior ports, and the cars are pushed up an incline on to a trestle. Under this trestle are large bins which are built right on the docks where the lake steamers tie up awaiting their cargo.

The Ore-carriers of the Great Lakes

To anyone who is familiar with the usual cargo steamers, the ore-steamers that are used on the great lakes look very strange indeed. They are long, low, flat-bottomed steamers—some of them as long as 625 feet—and they look even longer,



Sectional drawing of the Missabe range
NOTE -- The name of this range is often spelled "Mesabi"

because the pilot house and crew's quarters are located away up forward in the bow, while the boilers, engines and funnel are at the stern. This leaves almost all of the ship's length unencumbered between the bow and the stern for the hold, and it is here that the ore is stowed. This hold is covered by a deck with hatches or sliding covers. A typical ore-carrying vessel is shown on page 3. The peculiar design of these ships is the result of many years' experience and endeavor to build vessels that can transport the greatest amount of ore at the least cost. One of the factors that limits the size of the vessels is the Soo Canal, through which the vessels must pass from Lake Superior to enter Lake Huron and the other great lakes. The Soo Canal locks are 61 feet wide, and the ore vessels are built with a maximum beam of 60 feet — allowing a clearance of only six inches on each side of the lock walls. The door sills of the locks are 19 feet 1 inch high, and the large boats draw 19 feet 2 inches. Starting up the vessel's propeller forces another inch of water into the lock, and in floats the boat. Close figuring!

In our next installment the method of loading the boats will be described, and we shall follow the ore on its journey to the blast furnace.

(*To be continued*)

My first adventure in a Seaplane

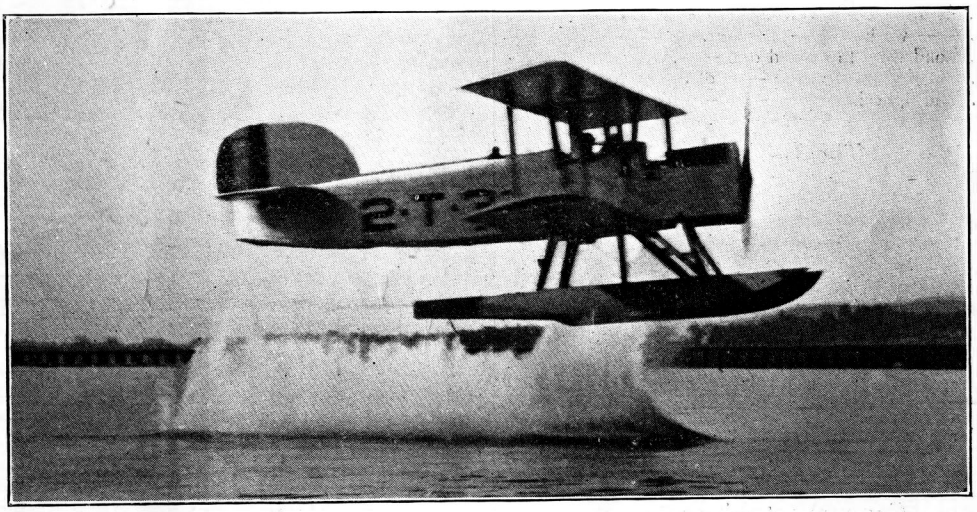
In the last issue the author described his first trip in the air. The plane had been sailing along smoothly when suddenly the motor stopped, the seaplane dropped with ever-increasing speed toward the sea, and the chapter ended with the author breathlessly awaiting the crash that seemed inevitable.

A second passed—then a terrific noise greeted my ears. I opened my eyes in surprise, and found that we had flattened out a few feet above the sea, and the roar of the engine's exhaust was the deafening noise that had so scared me! With infinite relief I gazed around and marveled at the ability of my pilot to ward off what seemed certain death. My musings were soon cut short, however, for with an impish grin on his face the lieutenant turned around and waved a hand. I realized then that he had been having a little fun at my expense. Great fellows, these pilots.

Presently another airplane drew alongside and the two ships flew side-by-side for a short time. Then, without any warning, our companion plane made a slight dip, and from beneath its fuselage dropped a torpedo. With a mighty splash it entered the water and sped away, traveling just below the surface. I followed the course of the torpedo by the wake which its churning propellers made, but as our plane made a big sweep towards the shore I soon lost sight of it.

I learned later that the torpedo plane was one of several attached to the Naval Air Base nearby.

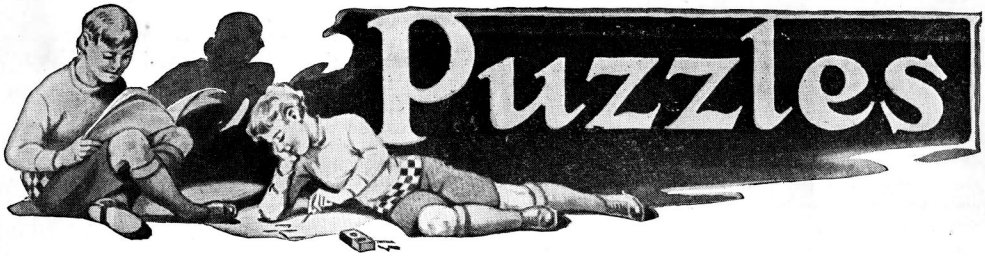
While I had been trying to follow the course of the torpedo we had been climbing higher, and now we were a thousand feet or more above the sea. The lieutenant had again shut off the engine and we started to volplane, or "coast" in huge circles, each one bringing us a bit nearer to the surface of the water. This continued until we were hardly more than a hundred feet up, when the lieutenant straightened out the plane and made a perfect landing—if alighting on the water may be called that. He had calculated so accurately that I could scarcely tell when the plane touched the water. We were a hundred yards or more from the shore and it took a very short time to taxi over to our starting place and have the plane made fast. It did not take me long to get out and remove my flying togs, but it was some time before the stinging of the wind left my face.



"With a mighty splash the torpedo entered the water and sped away"

So ended my first adventure in the air. The lieutenant told me that we had been in no danger of crashing during the hasty drop, as he had the plane in complete control and could have straightened it out at any time during the fall. How he actually did it is a miracle to me, and I was thankful that his judgment was so accurate that he did not allow the plane to fall too near the sea before bringing it out of its headlong dash. This first flight gave me some thrills that are still very vivid in my mind and I hope that the opportunity to go aloft will soon come to each Meccano boy, so that they will be able to enjoy the pleasures of airplaning.

THE END



Five minutes to solve this one

Puzzle No 13

In each of the following sentences the second of the two missing words is the first one reversed.

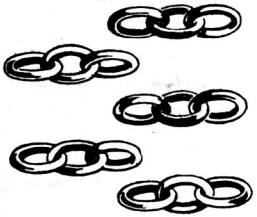
1. At any —— a volcano may —— smoke.
2. —— we have —— the war.
3. Load —— to exceed one ——.
4. Put the —— on the —— of the stove.
5. The light is very —— at —— night.

* * *

The Broken Chain

No. 14

A lady brought to a jeweler a chain which had broken into five pieces and asked to have it mended, agreeing to pay him 25 cents for every link that he had to break and weld. When it was finished she was surprised that he charged her but 75 cents for the job. How did the jeweler manage to mend the chain by breaking only three of the links?



* * *

Can you get this sentence?

No. 15

By placing the letter "I" at the proper points in the following diagram a sentence can be made. The end of a line does not necessarily mean the end of a word.

B L L S S T
L L L V N G
W T H J M S
M T H N T H
S B G C T Y

* * *

No. 16

When are roads annoyed with one another?

* * *

Ask Dad to help you with this one

No. 17

In a certain room were one grandmother, three mothers, two aunts, four sisters, two brothers, four daughters, two sons, five cousins, three nieces, two nephews, three grand-daughters, and two grand-sons. How many persons were there in the room?

Awards in the Limerick Contest

Our first Limerick Contest closed on July 1st, and judging from the large number of entries this form of competition is very popular with our readers. After carefully considering each entry, the first prize—a No. 2 Clockwork Motor—was awarded to

Edward H. Bilderback, Woodstown, N. J.

The completed limerick, with the prize-winning last line, is as follows:

A bright little fellow named Ray
Built a truck with Meccano one day.
He had so much fun
By making it run,
That he builds something new every day.

The second prize—a Meccano Builder's Cabinet—was awarded to Herbert Brown, 41 Massachusetts Ave., Lexington, Mass. He submitted the following line:

That it paid for his labor that way.

By a strange coincidence the line for which the judges awarded the third prize was entered by three boys in widely separated parts of the country. They are Gerald Ingraham, Townville, Pa.; Herbert O. Livergood, 3310 Pershing Dr., El Paso, Texas, and Harvey Richert, 1572 18th St., Milwaukee, Wis. Each of these boys was awarded the full amount of the third prize—a Meccano Electrical Accessory Outfit. Their last line is:

That he played with it day after day.

We congratulate the prize-winners on their success and urge them, as well as those who were not so fortunate, to enter the new Limerick Contest announced on the next page.

* * *

Answers to Puzzles in the Last Issue

No. 10. North, South, East, West.

No. 11. A piece of rope.

No. 12. A sponge.

Cross-word Puzzle

Horizontal: 2 bolts, 8 far, 10 as, 12 lt., 13 yea, 15 par, 16 Meccano, 17 ant, 18 ten, 21 own, 23 pen, 24 net, 25 our.

Vertical: 1 strip, 3 of, 4 lac, 5 TR, 6 wheel, 7 layman, 9 strong, 11 seen, 12 lane, 14 action, 15 patent, 19 cap, 20 car, 22 we.

Our Contest Column

Second Limerick Contest

So many of our readers have asked for another limerick contest that we are complying with their request and announce our Second Limerick Contest.

Any reader may enter as many last-lines as he wishes, and there are no entrance fees. The prizes to be awarded are as follows:

First Prize . . . . No. 2 Clockwork Motor
Second Prize . Meccano Builder's Cabinet

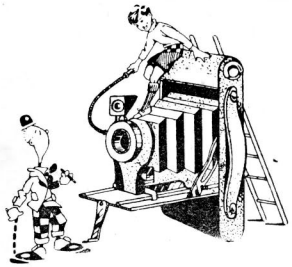
The uncompleted limerick appears below, and the prizes will be awarded for the best lines submitted to complete it.

Meccano boys are a happy throng,
Building and playing the whole day long.
"It's more than a toy,"
Is the cry of each boy,

.....

The contest closes on Sept 1st, 1925, and the list of prize-winners and the winning answers will be published in the "*M.M*" as soon thereafter as possible. Each entry should bear the competitor's full name and address, together with his age, and should be addressed: "Second Limerick Contest, Meccano Magazine, Elizabeth, N. J."

Our First Photo Contest



This contest is open to all readers of the "*M. M.*" and there is no entry fee. It will be divided into two sections:

Sec. 1. Structural (photos of buildings, machinery, bridges, cranes, etc.)
Sec. 2. Miscellaneous (landscapes, animals, seashore scenes, etc.)

The prize for the best photograph in Section 1 will be a No. 2 Clockwork Motor, and an Electrical Accessory Outfit will be awarded for the best photograph in Section 2.

There are no restrictions and any type of camera may be used. Prints may be of any size and finished in any way. They may be mounted or not, and should be carefully packed so that they will not be damaged in the mails.

The photographs must be taken by the competitor

(*Continued in next column*)

MECCANO MAGAZINE
for Boys

Published every second month throughout the year by MECCANO COMPANY, INC., ELIZABETH, N. J.
Subscription price, 25 cents for six issues

All correspondence should be addressed to "The Editor, *Meccano Magazine*, Elizabeth, N. J." Subscriptions may be paid by stamps or money order; if a receipt is desired a stamped addressed envelope should be enclosed.

Change of Address—Subscribers should notify the Editor at once of any change of address. Send a postcard,—*giving both old and new addresses,*—so that our records can be kept up-to-date.

The Meccano Electrical Accessory Outfit Reduced to $2.00

Contains an assortment of electrical accessories especially designed for use with Meccano parts for building electrical models. A complete manual of instructions is included showing how to make electric bells, signals, magnets, a complete telegraph system, and many others. Price reduced to $2.00.

Our First Photo Contest (*continued*)

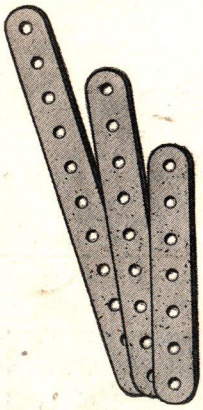
but the developing and printing may be done by others. Each entry, however, should state whether the photograph is the competitor's sole work throughout (that is, taken, developed and printed by him) as this will be taken into consideration when the awards are made.

The contest closes on Sept. 30th, 1925, and the winning photos will be published in the "*M. M.*"

Printed in the U. S. A. by the Meccano Printing Dept.

Plain Facts

The System of Equidistant Holes

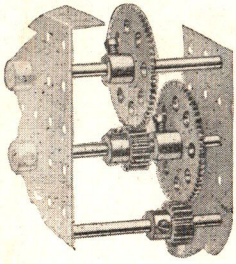


The Perforated Strips originated by Meccano.

When, more than 20 years ago, Meccano originated the system of equidistant holes, the spacing of half an inch was adopted. This standard of spacing was carefully worked out and it has proven to be indispensable to sound model-building.

Makes Parts Interchangeable

It is because of the half-inch equidistant holes that Meccano parts are so adaptable and interchangeable. By means of these holes a joint, a bearing or a fastening can be made wherever desired; they form a standard unit of measurement. There is no straining or stressing, and the parts fit together perfectly. There is nothing to change.



With Meccano perforated plates and standardized gears many ratios of speed and power can be obtained.

Used for Gears

Gears and pinions are made to correspond with the half-inch standard, and when they are secured to rods passed through these holes they will mesh accurately and give definite ratios of power and speed.

A Complete System

Each Meccano part has been carefully designed to preform a variety of functions in conjunction with other Meccano parts. Individidually each part has a definite place in the Meccano system; collectively the parts form a completely co-ordinated system of engineering units. Because the system is so complete, practically any movement known to mechanics can be duplicated.

MECCANO

Engineering for Boys

MECCANO COMPANY, INC. ELIZABETH, NEW JERSEY

The Largest and Most Powerful Locomotive in the World

A New Electric Giant that weighs 1,275,900 Pounds

The Strength of over 7,000 Horses

Imagine a team of horses, two abreast, stretching for over five miles! Such an unheard-of team would it take to equal the power of the latest railroad marvel—the largest and most powerful locomotive in the world. This locomotive, an electric giant 151 feet long and weighing over 637 tons, recently underwent its first running test. Its acceleration and the power of the motors were tested and the results were even better than the designers had anticipated. By locking some of the wheels and throwing power on others it was demonstrated that the wheels could be slipped without injury to the motors. This proved that even if some of the motors should become disabled, the locomotive would still be able to proceed under its own power.

How the Electric Locomotive Re-generates Power

Another test was that of regeneration. This is the remarkable ability of the electric locomotive to regenerate power while taking heavy trains down steep grades and to turn the power back into the transmission line. The theory of regeneration is quite simple and Meccano boys should readily be able to understand it. It is well known that certain types of electric motors can also be used as dynamos. As most boys know, a dynamo generates electric current, and it is only necessary to drive the armature shaft of the motor by means of an engine or some other form of power, and the motor functions as a dynamo and delivers current from its terminals.

An Example of Re-generation

Let us imagine that our locomotive has just pulled a heavy train of cars up a steep grade, and has reached the top. As soon as the train has started on its downward trip, it is no longer necessary for the locomotive to pull the train, as the heavy cars are forced by their own weight and by gravity to coast down the hill. The motors in the locomotive are geared to the driving wheels, and as the locomotive coasts down the hill these are caused to turn. The armature shafts of the motors, being connected to the driving wheels, must also turn, and in doing so they generate electricity. This action is known as regeneration, and the current developed is delivered to the power line. Some electric locomotives operating in mountainous territory return to the line by regeneration on steep down grades about 40% of the current consumed on the upgrades. This results in a considerable saving in electricity and gives electric locomotives a decided advantage over their steam-driven brothers for work in hilly territory.

The most powerful locomotive in the world. Built by Westinghouse for the Virginian Railroad

The Electric Brake

The grade is a steep one, and if no brakes are used the train will soon travel so fast that it would be impossible to control it. Here is where regeneration proves its worth, for it not only creates current, but it acts as an electric brake while doing so, and aids the engineer in keeping the train within his control. It takes a considerable amount of power to turn the huge motors on the locomotive and when the train is coasting and the motors are regenerating, they act as a drag on the train and slow it up.

The locomotive illustrated here is the first of 36 ordered by the Virginian Railway for its electrification project between Mullens, W. Va., and Roanoke, Va., and was built by the Westinghouse Electric and Manufacturing Co., and the American Locomotive Co.

These locomotives are so huge that it was necessary to build them in three units each so that the great length of more than 150 feet could successfully negotiate curves and be controlled efficiently. Each unit weighs approximately 425,000 pounds, so that the weight of the three-cab road engines is 637½ tons. Each driving motor has mounted at each end of the shaft a pinion which meshes with a flexible gear and the gears are mounted on a jack shaft, the power being transmitted from the gear centers to the drive wheels by means of side rods.

A Fifteen Million Dollar Contract

The Virginian R. R. Co.'s electrification contract was the largest ever awarded, amounting to $15,000,000; all electrical apparatus is to be furnished by the Westinghouse Company, to whom we are indebted for our photograph and data. The electrification includes 33.6 miles of route and 213 track miles. To provide for the application of greater power to the transmission system, the Virginian locomotives have been designed for either 11,000 or 22,000 volt current. The power-plant for supplying this current is rapidly nearing completion and it is expected that complete operation of the entire section will be started before the close of the present year. The remainder of the locomotives, after the first is delivered, will be shipped from the Westinghouse works on a schedule of one or two monthly.

The Locomotive of the Future

Slowly but steadily the electric locomotive is supplanting the steam locomotive, and the electrification project of the Virginian Railway is one more important addition to the increasing mileage of track that electricity has wrested from steam.

The ease with which electric trains are handled shows that electricity gives smoother, more reliable and faster running than steam. In addition, great economy results from electrical operation. The most remarkable improvement, however, is in the comfort and pleasure of the passengers. Where previously an otherwise pleasant journey was spoiled by smoke and cinders from the steam locomotive, it is now possible to enjoy the ever-changing scenery from an open car-window or observation platform without inconvenience from this source.

What Edison Predicts

A monster new electric locomotive of 4,200 horse-power was recently on exhibition at Newark, N. J., and was visited by Thomas A. Edison, the famous inventor. He made a close inspection of the locomotive, examining every working part and keeping up a running fire of technical questions. After the examination he was asked for a statement, and waving his hand towards the locomotive he said; "This is an indication of what can and will be done with 'white coal' or electricity. Every railroad must come to it eventually. Every motor vehicle, truck and pleasure car will some day be propelled by electricity. Its powers and uses are still but little known."

Other Electrified Railroads

Three large railroads operate trains electrically from New York—the New Haven R. R., to New Haven, a distance of 75 miles, the New York Central to Harmon, 20 miles and the Pennsylvania to Manhattan Transfer, 10 miles.

The most notable example of electrified railroads is on the Chicago, Milwaukee and St. Paul system. Electric locomotives pull the trans-continental trains from Harlowton, Montana, over the Rocky Mountains to Tacoma, Washington, a total distance of 649 miles. The locomotive inspected by Mr. Edison was built for this line and weighs 283 tons. An illustrated article dealing with this locomotive is in preparation and will be published in a future issue of the "*M.M.*"